

CLAIMS

5 1. Method of communicating on a network (800) having communication devices (801 to 809), each communication device being adapted to determine, for each item of information which it has to transmit, the path to cause it to follow on the network and a transmission mode, connected or non-connected, characterised in that it includes:

10 - for each communication device which is to effect a transmission in connected mode, an information operation (313) during which said communication device broadcasts, to all the other communication devices in the network, an item of information (253) representing the passband necessary for said transmission in connected mode, and

15 - an operation of allocating a passband (1221), during which there is allocated, on the one hand, to the transmissions in connected mode, the passband which is necessary to them and, on the other hand, all or part of the passband available to each transmission to be effected in non-connected mode.

2. Communication method according to Claim 1, characterised in that it includes, for the establishment of a connection:

20 - effected by the source communication device (801) intended to transmit information on said path, an operation of transmitting (305), to each communication device placed on said path, referred to as "intermediate" (803, 804), an item of information (251) representing the passband necessary for said connection, and

25 - effected by each intermediate communication device on said path, an operation of determining the availability (1402, 1404) of the link leading to the following communication device on said path and, in the event of unavailability, an operation of transmitting (333), to the source communication device, an item of information representing the unavailability of said path.

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a 3. Communication method according to ^{claim 1} ~~either one of Claims 1 or 2~~, characterised in that it includes, for each transmission of information, a flow control operation performed by each of the intermediate communication devices
5 on the path followed by said information.

4. Communication method according to Claim 3, characterised in that the flow control operation performed by each intermediate communication device is performed in accordance with IEEE 1355.

10 5. Communication method according to ^{claim 1} ~~any one of Claims 1 to 4~~, characterised in that it includes:

- for each communication device in the network, following each information operation, an operation of determining the passband (1303, 1403,
15 1503) available on each link, taking into account said information, and

- for each so-called "source" communication device which is to effect a transmission in non-connected mode to a destination communication device:

• an operation of determining the availability of a path for a
20 transmission in non-connected mode, during which it is determined whether at least one path going from said source communication device to said destination communication device is at least partially available for said transmission,

• and, in the affirmative, an operation of transmitting on said path, in non-connected mode.

25 6. Communication method according to ^{claim 1} ~~any one of Claims 1 to 5~~, characterised in that it includes an information transmission operation (254, 257, 259) taking several priority levels into account.

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7. Communication method according to Claim 6, characterised in that a priority level is allocated to transmission in non-connected mode.

8. Communication method according to ^{claim 6} ~~either one of Claims 6 or 7~~, characterised in that, during the passband allocation operation (1221), the passband associated with the priority level corresponding to the non-connected mode varies as a function of a period which did not give rise to any transmission.

9. Communication method according to Claim 8, characterised in that the said period is a period separating the last transmission in non-connected mode and the next transmission in connected mode.

10. Communication method according to ^{claim 6} ~~any one of Claims 6 to 9~~, characterised in that, during the passband allocation operation (1221), the passband associated with the priority level corresponding to the non-connected mode varies as a function of a number of packets not transmitted during a predetermined period.

11. Communication method according to ^{claim 6} ~~any one of Claims 6 to 10~~, characterised in that the predictive real-time traffic is transmitted with a priority level greater than that of the guaranteed real-time traffic.

12. Communication method according to ^{claim 6} ~~any one of Claims 6 to 11~~, characterised in that each priority level is associated with a list of virtual channels (1105 to 1110), successively used.

13. Communication method according to Claim 12, characterised in that said virtual channels are associated with the outgoing traffic.

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14. Communication method according to ^{claim 12} ~~either one of Claims 12 or 13~~, characterised in that it includes a traffic parameter determination operation (1221), during which a size of packets transmitted on said network is determined, said operation taking into account the load on said network.

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claim 12

15. Communication method according to ~~any one of Claims 12 to 14~~, characterised in that it includes a traffic parameter determination operation (1221), during which a number of packets to be sent on said network is determined, said operation taking into account the load on said network.

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claim 12

16. Communication method according to ~~any one of Claims 12 to 15~~, characterised in that it includes a traffic parameter determination operation (1221) during which a period available for sending the packets remaining to be sent on said network is determined, said operation taking into account the load on said network.

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claim 14

17. Communication method according to ~~any one of Claims 14 to 16~~, characterised in that the traffic parameter determination operation (1221) takes place, for each communication device, during the information step.

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claim 14

18. Communication method according to ~~any one of Claims 14 to 17~~, characterised in that the traffic parameter determination operation (1221) takes place, for each communication device, virtual channel by virtual channel.

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claim 14

19. Communication method according to ~~any one of Claims 14 to 18~~, characterised in that the traffic parameter determination operation (1221) is performed during the information operation (313).

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claim 6

20. Communication method according to ~~any one of Claims 6 to 19~~, characterised in that it includes a control information transmission

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operation, during which each item of control information is transmitted with the highest priority level.

21. Communication method according to ^{claim 6} ~~any one of Claims 6 to 20~~, characterised in that, for at least one priority level, the information not transmitted during a predetermined interval of time is eliminated before transmission.

22. Communication method according to ^{claim 6} ~~any one of Claims 6 to 21~~, characterised in that, for at least one priority level, the information not transmitted during a predetermined interval of time is stored in order to be transmitted during the following time interval.

23. Communication method according to ^{claim 1} ~~any one of Claims 1 to 22~~, characterised in that the real-time traffic, predictive or guaranteed, is transmitted in connected mode.

24. Communication method according to ^{claim 1} ~~any one of Claims 1 to 23~~, characterised in that the elastic traffic is transmitted in non-connected mode.

25. Communication method according to ^{claim 1} ~~any one of Claims 1 to 24~~, characterised in that it includes, for each communication device placed on the path intended to be followed by a transmission in connected mode, a checking operation (1404), during which it is checked that the passband necessary for said transmission is available on said path.

26. Communication method according to ^{claim 1} ~~any one of Claims 1 to 25~~, characterised in that, for the predictive traffic, the information not

transmitted during a predetermined time interval is eliminated before transmission.

27. Communication method according to, ^{Claim 1} ~~any one of Claims 1 to 26~~, characterised in that, for the guaranteed traffic, the information not transmitted during a predetermined time interval is stored in order to be transmitted during the following time interval.

28. Method according to, ^{Claim 1} ~~any one of Claims 1 to 27~~, characterised in that each communication device effects each information transmission by packet switching.

29. Communication method according to, ^{Claim 1} ~~any one of Claims 1 to 28~~, characterised in that it includes, for establishing a connection:

A/ performed by a communication device which is a source of information to be transmitted in connected mode:

- an operation of determining a passband requirement for the transmission of said information in connected mode,
- an operation of determining any path available for said transmission, according to information stored in a load table for each link in the network, and
- when an available path is determined:
 - an operation of sending an item of information representing said passband requirement to the following communication device on said path, and
 - an operation of updating said load table for the links in the network,
- an operation of broadcasting, to at least all the communication devices outside the path, an item of information representing said passband requirement,

B/ performed by each intermediate communication device on said path:

- an operation of determining availability of said path, for said communication, according to information stored in a load table for each link in the network, and

- when the path is available:

- an operation of sending an item of information representing said passband requirement, to the following communication device on the path, and

- an operation of updating a load table for the links in the network,

C/ performed by each communication device outside said path:

- an operation of updating a load table for the links in the network.

30. Communication method according to ^{Claim 1} ~~any one of Claims 1 to 29~~, between communication devices each able to determine, for each item of information which it has to transmit, a path to cause it to follow, characterised in that it includes:

- performed by each so-called "source" communication device, which requires a connection associated with a path, in order to effect a transmission of information to a destination communication device, an operation of requesting a connection, during which the source communication device sends, to each communication device on said path, a request to establish a connection,

- when establishment of said connection is possible, performed by at least the destination communication device, an operation of sending, to the source communication device, a connection acceptance,

- performed by the source communication device, an operation of broadcasting, to all the communication devices in the network, an item of information representing the establishment of the connection,

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- performed by each communication device on said path, on reception of said information representing the establishment of a connection, an operation of confirmation of establishment of said connection, and

5 - performed by each communication device outside said path, on reception of said information representing the establishment of a connection, an operation of storing an item of information representing said connection.

31. Device for communication on a network having communication devices, each communication device being adapted to
10 determine, for each item of information which it has to transmit, a path to cause it to follow on the network and a transmission mode, connected or not, characterised in that it has:

- an information means adapted, for each transmission in connected mode, to broadcast, to all the other communication devices in the
15 network, an item of information representing the passband necessary for said transmission in connected mode, and

- a passband allocation means, adapted to allocate, on the one hand, to the transmissions in connected mode, the passband which is necessary to them, and, on the other hand, all or part of the passband available to each
20 transmission to be effected in non-connected mode.

32. Communication device according to Claim 31, characterised in that:

- the information means is adapted, for the establishment of a
25 connection, to transmit, to each communication device placed on said path, referred to as "intermediate", an item of information representing the passband necessary for said connection, and

- it has a means of determining availability in connected mode, adapted, when said communication device is an intermediate communication
30 device on a path intended to be associated with a connection, to determine the

availability of the link leading to the following communication device on said path and, in the event of unavailability, to cause a transmission means to transmit, to the source communication device, an item of information representing the unavailability of said path.

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a 33. Communication device according to ^{claim 1} ~~either one of Claims 31 or 32~~, characterised in that it has a flow control means adapted, for each transmission of information in non-connected mode for which said device is incorporated in an intermediate communication device, to check the availability of the path followed by said information.

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34. Communication device according to Claim 33, characterised in that it is adapted to implement communication procedures in accordance with IEEE 1355.

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a 35. Communication device according to ^{claim 1} ~~any one of Claims 31 to 34~~, characterised in that it has an available passband determination means adapted:

20 - to determine the passband available on each link of a path associated with a connection, on reception of each item of information representing a passband coming from another communication device, taking said information into account, and

25 - when said communication device must effect a transmission in non-connected mode to a destination communication device, to determine the at least partial availability of at least one path going from said source communication device to said destination communication device for a transmission in non-connected mode.

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a 36. Communication device according to ~~any one of Claims 31 to 35~~ ^{Claim 31}, characterised in that it has an information transmission means taking into account several priority levels.

5 37. Communication device according to Claim 36, characterised in that the transmission means is adapted so that a priority level is allocated to the transmission in non-connected mode.

a 38. Communication device according to ~~either one of Claims 36 or 37~~ ^{Claim 36}, characterised in that the passband allocation means is adapted so that the passband associated with the priority level corresponding to the non-connected mode varies according to a period which has not given rise to any transmission.

10 39. Communication device according to Claim 38, characterised in that the passband allocation means is adapted so that said period is the period separating the last transmission in non-connected mode and the next transmission in connected mode.

a 40. Communication device according to ~~any one of Claims 36 to 39~~ ^{Claim 36}, characterised in that the passband allocation means is adapted so that the passband associated with the priority level corresponding to the non-connected mode varies according to a number of packets not transmitted during a predetermined period.

a 25 41. Communication device according to ~~any one of Claims 36 to 40~~ ^{Claim 36}, characterised in that the information transmission means is adapted so that the predictive real-time traffic is transmitted with a priority level higher than that of the guaranteed real-time traffic.

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a 42. Communication device according to ~~any one of Claims 36 to 41~~, characterised in that the information transmission means is adapted so that each priority level is associated with a list of virtual channels, used in succession.

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43. Communication according to Claim 42, characterised in that the information transmission means is adapted so that said virtual channels are associated with the outgoing traffic.

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a 44. Communication device according to ~~either one of Claims 42 or 43~~, characterised in that it includes a traffic parameter determination means adapted to determine a size of packets transmitted on said network, taking into account the load on said network.

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a 45. Communication device according to ~~any one of Claims 42 to 44~~, characterised in that it has a traffic parameter determination means adapted to determine a number of packets to be sent on said network, taking into account the load on said network.

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a 46. Communication device according to ~~any one of Claims 42 to 45~~, characterised in that it has a traffic parameter determination means adapted to determine a period available for sending the packets remaining to be sent on said network, taking into account the load on said network.

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a 47. Communication device according to ~~any one of Claims 44 to 46~~, characterised in that the traffic parameter determination means is adapted to determine said parameters, virtual channel by virtual channel.

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a *Sub B⁴* 48. Communication device according to ~~any one of Claims 36 to 47~~, characterised in that the transmission means is adapted to transmit each item of control information with the highest priority level.

a 49. Communication device according to ^{*claim 36*} ~~any one of Claims 36 to 48~~, characterised in that the transmission means is adapted so that, for at least one priority level, the information not transmitted during a predetermined time interval is eliminated before transmission.

a 50. Communication device according to ^{*claim 36*} ~~any one of Claims 36 to 49~~, characterised in that the transmission means is adapted so that, for at least one priority level, the information not transmitted during a predetermined time interval is stored in order to be transmitted during the following time interval.

a 51. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 50~~, characterised in that it is adapted so that the real-time traffic, predictive or guaranteed, is transmitted in connected mode.

a 52. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 51~~, characterised in that it is adapted so that the elastic traffic is transmitted in non-connected mode.

a 53. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 52~~, characterised in that each communication device placed on the path intended to be followed by a transmission in connected mode, has a checking means adapted to check that the passband necessary for said transmission is available on said path.

a 54. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 53~~, characterised in that it has a transmission means adapted to eliminate the information not transmitted during a predetermined time interval, for the predictive traffic.

a 55. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 54~~, characterised in that it has a transmission means adapted to store, for a subsequent transmission, the information not transmitted during a predetermined time interval, for the guaranteed traffic.

a 56. Device according to ^{*claim 31*} ~~any one of Claims 31 to 55~~, characterised in that each communication device is adapted to implement a protocol for the transmission of information by packet switching.

a 57. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 56~~, characterised in that it has:

- a means of determining free time in said base period after sequencing of all the transmissions, adapted to organise all the other transmissions, and

15 - a regulation means adapted to regulate the passband available for the transmissions in non-connected mode.

58. Communication device according to Claim 57, characterised in that said regulation means is adapted:

20 - to reduce the passband allocated to the transmissions in non-connected mode, when the free time is negative, and

- to increase the passband allocated to the transmissions in non-connected mode, when the free time is positive.

a 59. Communication device according to ^{*claim 31*} ~~any one of Claims 31 to 58~~, characterised in that:

- it has a memory adapted to store a load table containing information relating to the load on each link in the network, and

- it is adapted, for establishing a connection:

30 for the transmission of information in connected mode:

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- to determine a passband requirement for the transmission of said information in connected mode,

- to determine any path available for said transmission, according to information stored in said load table,

5 and, when an available path is determined,

- to cause the transmission means to send an item of information representing said passband requirement, to the following communication device on said path,

- to update said load table,

10 - to cause the transmission means to broadcast, to at least all the communication devices outside the path, an item of information representing said passband requirement.

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60. Communication device according to ~~any one of Claims 31 to~~ *claim 31* 59, on a network including communication devices each able to determine the path to cause each item of information which it has to send to follow, characterised in that it is adapted, when it needs a connection associated with a path, to effect a transmission of information to a destination communication device:

20 - to cause the transmission means to send, to each communication device on said path, a message requesting the establishment of a connection, and

- on reception of a connection acceptance message coming from the destination communication device, to cause said transmission means to broadcast, to all the communication devices on the network, a connection establishment information message.

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a 61. Computer, characterised in that it has a communication device according to ~~any one of Claims 31 to 60.~~ *claim 31*

a 62. Camera, characterised in that it has a communication device
^{claim 31}
 according to ~~any one of Claims 31 to 60.~~

u 63. Facsimile machine, characterised in that it has a
 5 communication device according to ^{claim 31}
~~any one of Claims 31 to 60.~~

u 64. Photographic apparatus, characterised in that it has a
 communication device according to ^{claim 31}
~~any one of Claims 31 to 60.~~

a 65. Television receiver, characterised in that it has a
 10 communication device according to ^{claim 31}
~~any one of Claims 31 to 60.~~

u 66. Printer, characterised in that it has a communication device
 according to ^{claim 31}
~~any one of Claims 31 to 60.~~

u 67. Scanner, characterised in that it has a communication device
 15 according to ^{claim 31}
~~any one of Claims 31 to 60.~~

u 68. Audio/video reader, characterised in that it has a
 20 communication device according to ^{claim 31}
~~any one of Claims 31 to 60.~~

u ^{Sub B⁶} 69. An information storage means which can be read by a
 computer or a microprocessor storing instructions of a computer program,
 characterised in that it allows the implementation of a communication method
 25 according to ^{claim 1}
~~any one of Claims 1 to 30.~~

u 70. An information storage means which is removable, partially or
 totally, and which can be read by a computer or a microprocessor storing
 instructions of a computer program, characterised in that it allows the
 30 implementation of a communication method according to ^{claim 1}
~~any one of Claims 1 to 30.~~

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71. Method of communicating between communication devices (101 to 105, 801 to 809) in a packet switched network having at least one switch (209), characterised in that it includes a transmission mode determination operation (1302), during which, for each item of information to be transmitted, a transmission mode is determined, connected or non-connected, and then

- for each item of information to be transmitted in connected mode:
 - an operation (1304 to 1308, 301 to 313) of reserving a path on said network, and then
 - an operation of transmitting said information (314), in connected mode, on the path reserved during the reservation operation, and
- for each item of information to be transmitted in non-connected mode:
 - an operation of estimating the availability of a path on said network, and then, when a path is deemed to be available for transmission of said information,
 - an operation of transmitting said information, on said path, in non-connected mode.

72. Communication method according to Claim 71, characterised in that the path reservation operation includes an operation of transmitting (305), on said path, a message (251) including information representing the application requirement for transmission in connected mode.

73. Communication method according to ^{claim 71/} ~~either one of Claims 71 or 72~~, characterised in that the operation of reserving a path on said network includes an operation of updating (1303, 1307, 1403, 1407, 1503, 1504) a load table (1100) stored by each communication device in the network.

74. Communication method according to Claim 73, characterised in that, during the availability estimation operation, values stored in the load table (1100) of the communication device which has at least one item of information to be transmitted are taken into account.

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75. Communication method according to ^{claim 73} ~~either one of Claims 73~~ or 74, characterised in that the table updating operation includes an operation of determining parameters (1303, 1403, 1503) representing the application requirement for transmission in connected mode.

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76. Communication method according to ^{claim 73} ~~any one of Claims 73 to 75~~, characterised in that the load table updating operation includes an operation of storing in memory the passband available for each link (1001 to 1004) on a path leaving the communication device under consideration (1011 to 1013).

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77. Communication method according to ^{claim 73} ~~any one of Claims 73 to 76~~, characterised in that the load table updating operation includes an operation of storing in memory the passband available for each link (1001 to 1007) in the network forming part of a path associated with a connection (1011 to 1015).

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78. Communication method according to ^{claim 71} ~~any one of Claims 71 to 77~~, characterised in that the path reservation operation includes an operation of checking (1404, 1405), by means of each intermediate communication device (803, 804) on said path, the availability of the path to be reserved.

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79. Communication method according to ^{claim 71} ~~any one of Claims 71 to 78~~, characterised in that the estimation operation consists of determining whether at least one path is at least partially available for transmission in non-connected mode.

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Claim 71
 80. Communication method according to ~~any one of Claims 71 to 79~~, characterised in that, during the availability estimation operation, information representing transmissions in connected mode is taken into account.

Claim 71
 81. Communication method according to ~~any one of Claims 71 to 80~~, characterised in that the estimation operation is independent of any transmissions in non-connected mode, coming from other communication devices in the network.

Claim 71
 82. Method according to ~~any one of Claims 71 to 81~~, characterised in that the network uses the IEEE 1355 communication protocol.

Claim 71
 83. Method according to ~~any one of Claims 71 to 82~~, characterised in that the reservation operation includes an operation of transmitting (305) a message (251) containing information representing each link on the path to be reserved.

Claim 71
 84. Method according to ~~any one of Claims 71 to 83~~, characterised in that the reservation operation includes:

- an operation of broadcasting (313) a table updating message (253) destined for all the communication devices in the network (802 to 809), and
- for each communication device in the network which is not on the path to be reserved, an operation of updating a load table (1504).

Claim 71
 85. Communication method according to ~~any one of Claims 71 to 84~~, characterised in that it includes, for establishing a connection:

A/ performed by a communication device which is a source of information to be transmitted in connected mode:

- an operation of determining a passband requirement for transmission of said information in connected mode,

- an operation of determining any path available for said transmission, according to information stored in a load table for each link in the network, and

- when an available path is determined:

- an operation of sending an item of information representing said passband requirement to the following communication device on said path, and

- an operation of updating said load table for the links in the network,

- an operation of broadcasting, to at least all the communication devices outside the path, an item of information representing said passband requirement,

B/ performed by each intermediate communication device on said path:

- an operation of determining the availability of said path, for said communication, according to information stored in a load table for each link in the network, and

- when the path is available:

- an operation of sending an item of information representing said passband requirement to the following communication device on said path, and

- an operation of updating said load table for the links in the network,

C/ performed by each communication device outside said path:

- an operation of updating a load table for the links in the network.

86. Communication method according to ^{Claim 71} ~~any one of Claims 71 to~~

85, between communication devices each able to determine the path to be

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followed by each item of information which it has to send, characterised in that it includes;

- performed by each so-called "source" communication device, which requires a connection associated with a path, in order to effect a transmission of information to a destination communication device, a connect
5 request operation, during which the source communication device sends, to each communication device on said path, a request for establishing a connection,

- when establishment of said connection is possible, performed by
10 at least the destination communication device, an operation of sending, to the source communication device, a connection acceptance,

- performed by the source communication device, an operation of broadcasting, to all the communication devices in the network, an item of information representing the establishment of the connection,

- performed by each communication device on said path, on
15 reception of said item of information representing the establishment of a connection, an operation of confirming the establishment of said connection, and

- performed by each communication device outside said path, on
20 reception of said information representing the establishment of a connection, an operation of storing in memory an item of information representing said connection.

87. Device for communicating on a packet switched network having at least one switch (209), characterised in that it has:

- a transmission mode determination means (204A, 204B, 206A, 206B, 234, 236) adapted to determine, for each item of information to be
25 transmitted, a transmission mode, connected or non-connected,

- a reservation means (204A, 204B, 206A, 206B, 234, 236) adapted, for each item of information to be transmitted in connected mode, to
30 reserve a path on said network,

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- a path availability estimation means (204A, 204B, 206A, 206B, 234, 236) adapted, for each item of information to be transmitted in non-connected mode, to estimate the availability of at least one path, and

- a transmissions means (204A, 204B, 206A, 206B, 234, 236) adapted on the one hand to transmit, in connected mode, each item of information to be transmitted in connected mode, on the path reserved by the reservation means, and on the other hand to transmit, in non-connected mode, on a path deemed to be available by the availability estimation means, each item of information to be transmitted in non-connected mode.

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88. Communication device according to Claim 87, characterised in that the reservation means is adapted to cause the transmission means to transmit, on said path, a message (251) including information representing the application requirement for transmission in connected mode.

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89. Communication device according to ^{claim 87} ~~either one of Claims 87 or 88~~, characterised in that it has a memory adapted to store a load table (1100) and in that the reservation means is adapted to update said load table.

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90. Communication device according to Claim 89, characterised in that the estimation means is adapted to take into account values stored in the load table (1100) in order to estimate the availability of a path.

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91. Communication device according to ^{claim 87} ~~either one of Claims 89 or 90~~, characterised in that, in order to update the load table (1100), the reservation means is adapted to determine parameters representing the application requirement for transmission in connected mode.

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92. Communication device according to ^{claim 89} ~~any one of Claims 89 to 91~~, characterised in that, in order to update the load table (1100), the reservation means is adapted to store therein the passband available for each

link (1001 to 1004) in a path (1011 to 1013) leaving the communication device under consideration.

a 5 93. Communication device according to ^{*claim 89*} ~~any one of Claims 89 to 92~~, characterised in that, in order to update the load table (1100), the reservation means is adapted to store therein the passband available for each link (1001 to 1007) in the network forming part of a path associated with a connection (1011 to 1015).

a 10 94. Communication device according to ^{*claim 87*} ~~any one of Claims 87 to 93~~, characterised in that the path reservation means is adapted to cause each intermediate communication device (803, 804) on said path to check the availability of the path to be reserved.

a 15 95. Communication device according to ^{*claim 87*} ~~any one of Claims 87 to 94~~, characterised in that the estimation means is adapted to determine whether at least one path is at least partially available for transmission in non-connected mode.

a 20 96. Communication device according to ^{*claim 87*} ~~any one of Claims 87 to 95~~, characterised in that the estimation means is adapted to take into account information representing transmissions in connected mode.

a 25 97. Communication device according to ^{*claim 87*} ~~any one of Claims 87 to 96~~, characterised in that the estimation means is adapted not to take into account any transmissions in non-connected mode coming from other communication devices in the network.

a 30 98. Device according to ^{*claim 87*} ~~any one of Claims 87 to 97~~, characterised in that the transmission means is adapted to implement the IEEE 1355 communication protocol.

a *Claim 87*
 99. Device according to ~~any one of Claims 87 to 98~~, characterised
 in that the reservation means is adapted to cause the transmission means to
 transmit a message (251) containing information representing each link on the
 5 path to be reserved for each transmission in connected mode.

a *Claim 87*
 100. Device according to ~~any one of Claims 87 to 99~~,
 characterised in that the reservation means is adapted:

- a* *Claim 87*
 - to cause the transmission means to broadcast a table-updating
 10 message (253) intended for all the communication devices in the network, and
 - when the communication device which includes said reservation
 means receives such a message, and when it is not on the path to be reserved,
 to update a load table.

a *Claim 87*
 101. Communication device according to ~~any one of Claims 87 to~~
~~100~~, characterised in that it:

- a* *Claim 87*
 - has a memory adapted to store a load table containing
 information relating to the load on each link in the network, and
 - is adapted, for establishing a connection:
 20 for transmitting information in connected mode:
 - to determine a passband requirement for transmission of said
 information in connected mode,
 - to determine any path available for said transmission, according
 to information stored in said load table,
 25 and, when an available path is determined,
 - to cause the transmission means to send an item of information
 representing said passband requirement, to the following communication device
 on said path,
 - to update said load table,

- to cause the transmission means to broadcast, to at least all the communication devices outside the path, an item of information representing said passband requirement.

a 5 102. Communication device according to ^{claim 87} ~~any one of Claims 87 to 104~~, on a network having communication devices each able to determine the path to be followed by each item of information which it has to send, characterised in that it is adapted, when it requires a connection associated with a path, in order to effect a transmission of information to a destination
10 communication device:

- to cause the transmission means to send, to each communication device on said path, a message requesting the establishment of a connection, and

- on reception of a connection acceptance message coming from
15 the destination communication device, to cause said transmission means to broadcast, to all the communication devices in the network, a message containing information on the establishment of the connection.

a 20 103. Computer, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102~~.

a 104. Camera, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102~~.

a 25 105. Facsimile machine, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102~~.

a 106. Photographic apparatus, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102~~.

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107. Television receiver, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102.~~

108. Printer, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102.~~

109. Scanner, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102.~~

110. Audio/video reader, characterised in that it has a communication device according to ^{claim 87} ~~any one of Claims 87 to 102.~~

111. An information storage means which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ^{claim 86} ~~any one of Claims 71 to 86.~~

112. An information storage means which is removable, partially or totally, and which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ^{claim 86} ~~any one of Claims 71 to 86.~~

113. Method of communicating on a network, characterised in that it includes, for establishing a connection:

A/ performed by a communication device which is a source of information to be transmitted in connected mode (801):

- an operation (1302) of determining a passband requirement for transmission of said information in connected mode,

- an operation of determining any path available for said transmission (1304), according to information stored in a load table for each link in the network, and

- when an available path is determined:

5 • an operation of transmitting (305) an item of information representing said passband requirement (251) to the following communication device on said path (803), and

 • an operation of updating (1307) said load table for the links in the network,

10 - an operation of broadcasting, to at least all the communication devices outside the path (805 to 809), an item of information representing said passband requirement (253),

B/ performed by each intermediate communication device (803, 804) on said path:

15 - an operation of determining the availability of said path (1404), for said communication, according to information stored in a load table for each link in the network, and

- when the path is available:

20 • an operation of transmitting (336) an item of information representing said passband requirement to the following communication device on said path (804, 802), and

 • an operation of updating said load table (1407) for the links in the network,

25 C/ performed by each communication device outside said path (805 to 809):

- an operation of updating a load table for the links in the network.

114. Communication method according to Claim 113, characterised in that, during the operation of transmitting (305) said passband requirement (251) to the following communication device on said path, the source communication device (801) transmits an item of information

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representing an application requirement for said transmission in connected mode.

115. Communication method according to Claim 114,
 5 characterised in that it includes, performed by each communication device in the network (801 to 809), an operation of determining communication parameters (1303, 1403, 1503) depending on the application requirement, and said parameters are taken into account in performing the table updating operation (1307, 1407, 1504).

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 116. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 115~~, characterised in that it includes, at the end of the transmission in connected mode:

15 - performed by a communication device which is a source of information transmitted in connected mode, an operation of broadcasting (320) an item of information representing the release of the connection (256), to all the communication devices in the network (802 to 809), and

- performed by each communication device in said network, an operation of updating a load table for the links in the network.

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a 117. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 116~~, characterised in that, during the establishment of a connection, the operation of broadcasting (313), to at least all the communication devices outside the path, an item of information representing said passband requirement is performed after each communication device on said path has performed:

25

- an operation of determining the availability of said path, for said communication, as a function of information stored in a load table for each link in the network, and

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- when the path is available:

- an operation of transmitting said passband requirement to the following communication device on the path, and
- an operation of updating a load table for the links in the network.

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a 118. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 117~~, characterised in that it includes, during the establishment of a connection, performed by the source communication device, an operation of determining the whole of the path (1304) intended to be followed by the information to be transmitted in connected mode.

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a 119. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 118~~, characterised in that, during the operation of transmitting (305) an item of information representing said passband requirement to the following communication device on said path (251), the source communication device transmits an item of information representing said path.

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a 120. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 119~~, characterised in that, during the broadcasting operation (313), the information representing said passband requirement follows a spanning tree for the network where at least half the leaves are intermediate communication devices or the destination communication device, on the path associated with the connection.

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a 121. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 120~~, characterised in that, during the broadcasting operation (313), the information representing said passband requirement is broadcast with an item of information representing the whole of the path associated with said connection.

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a 122. Communication method according to ^{*claim 113*} ~~any one of Claims 113 to 121~~, characterised in that each load table includes, for each link in the network, a reference (1120) concerning each path which includes said link and which is associated with a connection.

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123. Communication method according to Claim 122, characterised in that, with each link in the network, there is associated an item of information representing the passband available on said link.

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a 124. Communication method according to ^{*claim 113*} ~~any one of Claims 113 to 123~~, characterised in that each load table includes, for each path, a reference concerning each link which it includes.

125. Communication method according to Claim 124, characterised in that, with each path, there is associated an item of information representing the passband available on said path.

a 126. Communication method according to ^{*claim 123*} ~~Claims 123 and 125~~, characterised in that the item of information representing the passband available on said path is equal to the information on the passband available on the least available link in said path.

a 127. Communication method according to ^{*claim 123*} ~~any one of Claims 123 to 126~~, characterised in that, during the path determination operation (1304), the chosen path is a path whose availability is the highest.

a 128. Communication method according to ^{*claim 113*} ~~any one of Claims 113 to 127~~, characterised in that it includes, performed by the source communication device, an operation of determining the size of the packet to be transmitted on the network (1221), taking into account the load on said network.

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a 129. Communication method according to ^{Claim 113} ~~any one of Claims 113 to 128~~, characterised in that it includes, performed by the source communication device, an operation of determining the frequency of sending of packets to be transmitted on the network (1221), taking into account the load

5 on said network.

a 130. Method according to ^{Claim 113} ~~any one of Claims 113 to 129~~, characterised in that each communication device effects each transmission of information by packet switching.

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a 131. Method according to ^{Claim 113} ~~any one of Claims 113 to 130~~, for communicating between communication devices each able to determine, for each item of information which it has to transmit, a path to cause it to follow, characterised in that it includes:

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- performed by each so-called "source" communication device which requires a connection associated with a path, in order to effect a transmission of information to a destination communication device, a connection request operation, during which the source communication device transmits, to each communication device on said path, a request to establish a

20 connection,

- when the establishment of said connection is possible, performed by at least the destination communication device, an operation of sending, to the source communication device, a connection acceptance,

- performed by the source communication device, an operation of broadcasting, to all the communication devices in the network, an item of information representing the establishment of the connection,

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- performed by each communication device on said path, on reception of said item of information representing the establishment of a connection, an operation of confirming the establishment of said connection,

30 and

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- performed by each communication device outside said path, on reception of said item of information representing the establishment of a connection, an operation of storing in memory an item of information representing said connection.

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132. Device for communicating on a network, characterised in that:

- it has a memory (204A) adapted to store a load table containing information relating to the load on each link in the network, and

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- it is adapted, for establishing a connection intended for the transmission of information in connected mode:

- to determine a passband requirement for the transmission of said information in connected mode,

15

- to determine any path available for said transmission, as a function of information stored in said load table,

and, when an available path is determined,

- to transmit an item of information representing said passband requirement, to the following communication device on said path,

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- to update said load table,
- to broadcast, to at least all the communication devices outside the path, an item of information representing said passband requirement.

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133. Communication device according to Claim 132, characterised in that it is adapted, when it receives, from a source communication device, an item of information representing a passband requirement, associated with an item of information representing a path on which it is situated:

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- to determine the availability of said path, for said communication, as a function of information stored in said load table for each link in the network,

and, when the path is available,

- to transmit an item of information representing said passband requirement, to the following communication device on said path,
- to update said load table.

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134. Communication device according to ^{claim 113} ~~either one of Claims 132 or 133~~, characterised in that it is adapted, when it receives an item of information representing a passband requirement, associated with an item of information representing a path on which it is not situated, to update said load table.

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^{Sub B¹⁰} 135. Communication device according to ^{claim 132} ~~any one of Claims 132 to 134~~, characterised in that it is adapted, in order to transmit said passband requirement to the following communication device on said path, to transmit an item of information representing an application requirement for said transmission in connected mode.

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136. Communication device according to Claim 135, characterised in that it has a means of determining communication parameters depending on the application requirement, and in that it is adapted to update the load table whilst taking said parameters into account.

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137. Communication device according to ^{claim 132} ~~any one of Claims 132 to 136~~, characterised in that it is adapted, in order to end a transmission in connected mode, to broadcast an item of information representing the release of the connection to all the communication devices in the network, so that each communication device in said network updates a load table for the links in the network.

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138. Communication device according to ^{claim 132} ~~any one of Claims 132 to 137~~, characterised in that it is adapted, for the establishment, to determine

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the whole of the path intended to be followed by the information to be transmitted in connected mode.

a 139. Communication device according to ^{Claim 132} ~~any one of Claims 132 to 138~~, characterised in that, in order to transmit an item of information representing said passband requirement to the following communication device on said path, it is adapted to transmit an item of information representing said path.

a 140. Communication device according to ^{Claim 132} ~~any one of Claims 132 to 139~~, characterised in that it is adapted to cause the item of information representing said passband requirement to follow a spanning tree for the network where at least half the leaves are intermediate communication devices or the destination communication device, on the path associated with the connection.

a 141. Communication device according to ^{Claim 132} ~~any one of Claims 132 to 140~~, characterised in that it is adapted to broadcast, with the item of information representing said passband requirement, an item of information representing the whole of the path associated with said connection.

a 142. Communication device according to ^{Claim 132} ~~any one of Claims 132 to 141~~, characterised in that said memory is adapted to store, in each load table, for each link in the network, a reference concerning each path which includes said link and which is associated with a connection.

143. Communication device according to Claim 142, characterised in that said memory is adapted to store, in said node table, for each link in the network, an item of information representing the passband available on said link.

a 144. Communication device according to ^{claim 132} ~~any one of Claims 132 to 143~~, characterised in that said memory is adapted to store, in each load table, for each path, a reference concerning each link which it includes.

5 145. Communication device according to Claim 144, characterised in that said memory is adapted to store, in each load table, associated with each path, an item of information representing the passband available on said path.

a 10 146. Communication device according to ^{claim 143} ~~Claims 143 and 145~~, characterised in that said memory is adapted to store, in each load table, an item of information representing the passband available on said path equal to the information on the passband available on the least available link in said path.

a 15 147. Communication device according to ^{claim 144} ~~any one of Claims 144 to 146~~, characterised in that it is adapted, in order to determine a path, to choose the path whose availability is the highest.

a 20 148. Communication device according to ^{claim 132} ~~any one of Claims 132 to 147~~, characterised in that it has a means of determining the size of the packet to be transmitted on the network adapted to take into account the load on said network.

25 149. Communication device according to ^{claim 132} ~~any one of Claims 132 to 148~~, characterised in that it has a means of determining the frequency of sending of packets to be transmitted on the network adapted to take into account the load on said network.

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a 150. Device according to ^{claim 132} ~~any one of Claims 132 to 149~~, characterised in that it is adapted to effect each transmission of information by packet switching.

a 5 151. Communication device according to ^{claim 132} ~~any one of Claims 132 to 150~~, on a network having communication devices each able to determine the path to be followed by each item of information which it has to send, characterised in that it is adapted, when it requires a connection associated with a path, in order to effect a transmission of information to a destination communication device:

10 - to cause the transmission means to send, to each communication device on said path, a message requesting the establishment of a connection, and

15 - on reception of a connection acceptance message coming from the destination communication device, to cause said transmission means to broadcast, to all the communication devices in the network, a message containing information on the establishment of the connection.

a 20 152. Computer, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151~~.

a 153. Camera, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151~~.

a 25 154. Facsimile machine, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151~~.

a 30 155. Photographic apparatus, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151~~.

156. Television receiver, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151.~~

157. Printer, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151.~~

158. Scanner, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151.~~

159. Audio/video reader, characterised in that it has a communication device according to ^{claim 132} ~~any one of Claims 132 to 151.~~

160. An information storage means which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ^{claim 113} ~~any one of Claims 113 to 131.~~

161. An information storage means which is removable, partially or totally, and which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ^{claim 113} ~~any one of Claims 113 to 131.~~

162. Method of communicating on a network, between communication devices each able to determine the path to be followed by each item of information which it has to transmit, characterised in that it includes:

- performed by each so-called "source" communication device (801) which requires a connection associated with a path, in order to effect a transmission of information to a destination communication device (802), an operation (305) requesting a connection, during which the source

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communication device transmits, to each communication device on said path, a request to establish a connection (251),

- when establishment of said connection is possible, performed by at least the destination communication device, an operation of transmitting (381), to the source communication device, a connection acceptance (252),

- performed by the source communication device, an operation of broadcasting (313), to all the communication devices in the network, an item of information representing the establishment of the connection (253),

- performed by each communication device on said path (803, 804), on reception of said information representing the establishment of a connection, an operation (345) of confirming the establishment of said connection, and

- performed by each communication device outside said path (805 to 809), on reception of said information representing the establishment of a connection, an operation of storing in memory an item of information representing said connection (418).

163. Communication method according to Claim 162, characterised in that each communication device on said path (803, 804) performs, on reception of the request to establish a connection (251), an operation of verifying the possibility of establishing said connection (1404).

164. Communication method according to Claim 163, characterised in that each communication device on said path (803, 804), when, during the verification operation (1404), the possibility of establishing the connection has been verified, performs an operation of reserving resources necessary for said connection (1407).

165. Communication method according to Claim 163, characterised in that each communication device on said path (803, 804), when, during the checking operation (1404), the possibility of establishing the

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outside the path associated with the connection currently being established (805 to 809), the load table updating operation is performed on reception of the information representing the establishment of a connection.

a 5 171. Communication method according to ^{*claim 162*} ~~any one of Claims 162 to 170~~, characterised in that the operation of broadcasting (313), to all the communication devices in the network (802 to 809), an item of information representing the establishment of the connection, an operation performed by the source communication device (801), is performed on a spanning tree for the
10 network where at least half the leaves are intermediate communication devices or the destination communication device, on the path associated with the connection.

a 15 172. Communication method according to ^{*claim 162*} ~~any one of Claims 162 to 171~~, characterised in that the request (251) to establish a connection, sent by the source communication device (801), includes an item of information representing the application requirement for the transmission in connected mode associated with said connection.

a 20 173. Communication method according to ^{*claim 162*} ~~any one of Claims 162 to 172~~, characterised in that the connection establishment request (251) sent by the source communication device (801) includes an item of information representing the path associated with the connection currently being established.

a 25 174. Communication method according to ^{*claim 162*} ~~any one of Claims 162 to 173~~, characterised in that each communication device (801 to 809) effects each transmission of information by packet switching.

30 175. Device for communicating on a network having communication devices (801 to 809) each able to determine the path to be

followed by each item of information which it has to transmit, characterised in that it is adapted, when it requires a connection associated with a path, to effect a transmission of information to a destination communication device:

5 - to cause a transmission means to transmit, to each communication device (802 to 804) on said path, an item of information requesting (251) the establishment of a connection, and

10 - on reception of an item of information on the acceptance of a connection (252) coming from the destination communication device, to cause said transmission means to broadcast, to all the communication devices in the network (802 to 809), an item of information on the establishment of the connection (253).

15 176. Communication device according to Claim 175, characterised in that it is adapted, when it is the destination communication device (802) for a request to establish a connection (251), to determine whether the establishment of said connection is possible and, in this case, to cause the transmission means to transmit, to the source communication device (801), an item of information on the acceptance of the connection (252).

20 *a* 177. Communication device according to ^{claim 175} ~~either one of Claims 175 or 176~~, characterised in that it is adapted, when it receives an item of information on the establishment of the connection (251) and when it is situated on the path associated with the connection currently being established, to confirm the establishment of said connection.

25 *a* 178. Communication device according to ^{claim 175} ~~any one of Claims 175 to 177~~, characterised in that it is adapted, when it receives an item of information on the establishment of the connection (253) and when it is not situated on the path associated with the connection currently being established, 30 to store in memory an item of information representing said connection.

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179. Communication device according to ^{claim 175} ~~any one of Claims 175 to 178~~, characterised in that it is adapted, when it is a communication device on a path associated with a connection currently being established (802 to 804), to verify the possibility of establishing said connection (1404), on reception of the request to establish a connection (251).

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180. Communication device according to Claim 179, characterised in that, after having verified the possibility of establishing the connection (1404), said communication device (802 to 804) is adapted to reserve the resources available to it and which are necessary for said connection.

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181. Communication device according to Claim 179, characterised in that it is adapted, when the possibility of establishing the connection is not verified, to cause the transmission means to transmit, to the source communication device (801), an item of information representing the impossibility of setting up the connection by said intermediate communication device.

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182. Communication device according to ^{claim 175} ~~any one of Claims 175 to 181~~, characterised in that, when the establishment of said connection is possible, it is adapted to cause the transmission means to transmit, to the source communication device (801), the information representing a connection acceptance (252), solely when it is a destination communication device (802).

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183. Communication device according to Claim 182, characterised in that, in order to cause said item of information representing a connection acceptance (252) to be transmitted, the destination communication device (802) is adapted to choose a path independently of a path associated with the connection currently being established.

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a 184. Communication device according to ^{claim 175} ~~any one of Claims 175 to 183~~, characterised in that it has a memory (204A) adapted to store a load table containing information representing loads on links in the network incorporated in a path associated with a connection and in that it is adapted to

5 update said load table.

185. Communication device according to Claim 184, characterised in that it is adapted, when it is an intermediate (803, 804) or destination (802) communication device, to update the load table on reception

10 of the request to establish a connection (251).

186. Communication device according to Claim 185, characterised in that it is adapted, when it is situated outside the path associated with the connection currently being established, to update the load

15 table on reception of the information representing the establishment of a connection (253).

a 187. Communication device according to ^{claim 175} ~~any one of Claims 175 to 186~~, characterised in that it is adapted to cause the transmission means to

20 broadcast, to all the communication devices in the network (802 to 809), an item of information representing the establishment of the connection (253), causing this information to follow a spanning tree for the network where at least half the leaves are intermediate communication devices or the destination communication device, on the path associated with the connection.

a 188. Communication device according to ^{claim 175} ~~any one of Claims 175 to 187~~, characterised in that it is adapted so that the request to establish a connection (251), sent by the source communication device (801), includes an

30 item of information representing the application requirement for the transmission in connected mode associated with said connection.

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claim 175

189. Communication device according to ~~any one of Claims 175 to 188~~, characterised in that it is adapted so that the request to establish a connection (251), sent by the source communication device (801), includes an item of information representing the path associated with the connection currently being established.

claim 175

190. Communication device according to ~~any one of Claims 175 to 189~~, characterised in that it is adapted to function on a packet switched network.

claim 175

191. Computer, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

192. Camera, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

193. Facsimile machine, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

194. Photographic apparatus, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

195. Television receiver, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

196. Printer, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

claim 175

197. Scanner, characterised in that it has a communication device according to ~~any one of Claims 175 to 190~~.

198. Audio/video reader characterised in that it has a communication device according to ~~any one of Claims 175 to 190.~~ ^{Claim 175}

5 199. An information storage means which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ~~any one of Claims 162 to 174.~~ ^{Claim 162}

10 200. An information storage means which is removable, partially or totally, and which can be read by a computer or a microprocessor storing instructions of a computer program, characterised in that it allows the implementation of a communication method according to ~~any one of Claims 162 to 174.~~ ^{Claim 162}

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